

Appl. No. 09/370,178
Response dated September 17, 2004
Reply to Office Action of June 18, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 through 7 (Cancelled)

Claim 8. (Currently amended) A method of decoding q-ary encoded information symbols where q is a plural Integer, comprising the steps of:

providing, without any backwards computation, for each possible state of a decoding trellis at an information symbol time, q probability vectors for reaching the state via path of δ information symbols of the trellis, and a total probability of reaching the state, an updating the vectors and total probability for each state at a next information symbol time by the steps of:

(a) determining a probability for each of q possible transition paths from a state at said one information symbol time to the state at said next information symbol time;

(b) determining the total probability of reaching the state at said next information symbol time from the probabilities of the q possible transition paths to said state at said next information symbol time; and

(c) for each q possible information symbol values at each state at said next information symbol time, merging respective probability vectors for states at said one information symbol time in accordance with the respective probabilities of the transition paths from such states at said one information symbol time to the state at said next information symbol time; and

(d) determining a probability for an information symbol δ information symbols before said next information symbol time from respective elements of said probability vectors for all of the possible states at a respective information symbol time;

wherein steps (a), (b), (c) and (d) are performed for each and every path and steps (b), (c) and (d) are performed for each and every symbol.

Claim 9. (Original) A method as claimed in claim 8 wherein each probability vector provides logarithmic probabilities.

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Claim 10. (Original) A method as claimed in claim 8 wherein the q probability vectors for each state are represented by $q-1$ vectors of probability ratios.

Claim 11. (Original) A method as claimed in claim 10 wherein each vector provides logarithmic probability ratios.

Claim 12. (Original) A method as claimed in claim 10 wherein $q = 2$.

Claim 13. (Original) A method as claimed in claim 8 wherein $q = 2$.

Claim 14. (Original) A method as claimed in claim 8 and further including the step of, for each information symbol time, normalizing the total probabilities for all of the states.

Claim 15. (Currently amended) A method of decoding encoded binary information symbols comprising the steps of:

updating, without any backwards computation, for successive symbol times a vector of logarithmic probability ratios for each state of a decoding trellis at a respective symbol time, each vector corresponding to a survivor path through the decoding trellis, each logarithmic probability ratio representing in a logarithmic domain a ratio of the relative probabilities of the symbol representing a binary one of a binary zero, the updating comprising:

(a) determining probabilities for reaching each state via respective transition paths corresponding to binary one and zero values of the information symbols from respective states at a previous symbol time;

(b) combining said probabilities to determine total probability of reaching the state;
and

(c) for binary one and zero information symbol values at each state, merging respective probability vectors for the respective states at said previous information symbol time in accordance with the respective probabilities of the transition paths from such states;
and

(d) determining a probability ratio for an information symbol at the start of the survivor path from elements of the vectors for all of the possible states of the decoding trellis at a respective information symbol time;

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wherein steps (a), (b), (c) and (d) are performed for each and every path and steps (b), (c) and (d) are performed for each and every symbol.

Claim 16. (Original) A method as claimed in claim 15 and further including the step of, for each information symbol time, normalizing the total probabilities for all of the states.

Claim 17. (Original) A decoder arranged to carry out the method of claim 15.

Claim 18. (Currently amended) A method of decoding encoded binary information symbols comprising the steps of:

updating, without any backwards computation, for successive symbol times two vectors of logarithmic probabilities for each state of a decoding trellis at a respective symbol time, each vector corresponding to a survivor path through the decoding trellis, each logarithmic probability of the two vectors representing in a logarithmic domain a probability of the symbol representing a binary one or a binary zero respectively, the updating comprising:

- determining probabilities for reaching each state via respective transition paths corresponding to binary one and zero values of the information symbols from respective states at a previous symbol time;
- combining said probabilities to determine total probability of reaching the state; and
- for binary one and zero information symbol values at each state, merging respective probability vectors for the respective states at said previous information symbol time in accordance with the respective probabilities of the transition paths from such states; and
- determining a probability ratio for an information symbol at the start of the survivor path from elements of the vectors for all of the possible states of the decoding trellis at a respective information symbol time.

Claim 19. (Original) A method as claimed in claim 18 and further including the step of, for each information symbol time, normalizing the total probabilities for all of the states.

Claim 20. (Original) A decoder arranged to carry out the method of claim 18.